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WHAT IS CLAIMED

1. An electro-opto-mechanical assembly comprising:

a first wafer, said wafer having a top and bottom surface;

at least one optical element disposed on said top surface of said first wafer;

at least one discrete opto-electronic transducer element disposed in communication with said bottom surface of said first wafer and in optical communication with said optical element; and

an optical waveguide;

wherein said first wafer and said optical element form an optical relay which relays light between said discrete opto-electronic transducer and said optical waveguide and thereby forms an efficient optical coupling between said discrete opto-electronic transducer and said optical waveguide.

2. The assembly recited in claim 1, wherein said first wafer comprises a material selected from the group consisting of glass, plastic, sapphire, crystal, ceramic, metal, and semiconductor.

3. The assembly recited in claim 2 wherein said semiconductor material is selected from the group consisting of GaP, GaAs, InP, and Si.

4. The assembly recited in claim 1, wherein said optical element is selected from the group consisting of refractive lenses, GRIN lenses, diffractive lenses, holographic lenses, and gratings.

5. The assembly recited in claim 1, wherein said optical element has a conic constant between and including –2 to 1.

6. The assembly recited in claim 1, wherein said optical element further comprises an optical coating disposed on said optical element.

7. The assembly recited in claim 1, further comprising electrical contacts disposed on said bottom surface of said first wafer

8. The assembly recited in claim 1, wherein said first wafer has a thickness of between 50 and 2,000μm.

9. The assembly recited in claim 1, wherein said transducer is affixed to said first wafer by a solder.

10. The assembly recited in claim 9, wherein said solder is in the form of a self-aligning solder bump.

11. The assembly recited in claim 9, wherein said solder is indium.

12. The assembly recited in claim 1, wherein said transducer is affixed by a conductive epoxy.

13. The assembly recited in claim 1, further comprising a fill material between said first wafer and said transducer.

14. The assembly recited in claim 13, wherein said fill material and said wafer have substantially similar refractive indexes.

15. The assembly recited in claim 13, wherein said fill material is a two-part optical silicone.

16. The assembly recited in claim 1, further comprising an antireflective coating on said first wafer and between said transducer and said optical waveguide.

17. The assembly recited in claim 1, further comprising a micro rough surface on said first wafer and between said transducer and said optical waveguide.

18. The assembly recited in claim 1, further comprising a raised portion of said first wafer that is disposed above said transducer and said optical waveguide.

19. The assembly recited in claim 1, further comprising a passive alignment feature disposed in said top surface of said first wafer.

20. The assembly recited in claim 1, further comprising a second wafer having a top and bottom surface, said second wafer being disposed between said first wafer and said waveguide and said bottom of said second wafer being proximal to said top of said first wafer.

21. The assembly recited in claim 20 wherein said second wafer comprises a material selected from the group consisting of glass, plastic, sapphire, crystal, ceramic, metal and semiconductor.

22. The assembly recited in claim 21 wherein said semiconductor material is selected from the group consisting of GaP, GaAs, InP, and Si.

23. An electro-opto-mechanical assembly comprising:

a first wafer, said wafer having a top and bottom surface;

an optical waveguide proximal to said top surface of said first wafer;

a second wafer having a top and bottom surface, said second wafer being disposed between said first wafer and said waveguide and said bottom of said second wafer being proximal to said top of said first wafer;

at least one optical element disposed on said bottom surface of said second wafer; and

at least one discrete opto-electronic transducer element disposed in communication with said bottom surface of said first wafer and in optical communication with said optical element;

wherein said first wafer, said second wafer and said optical element form an optical relay which relays light between said discrete opto-electronic transducer and said optical waveguide and thereby forms an efficient optical coupling between said discrete opto-electronic transducer and said optical waveguide.

24. The assembly recited in claim 23, wherein said second wafer has a thickness of between 50 and 2,000μm.

25. An electro-opto-mechanical assembly comprising:

a first wafer, said wafer having a top and bottom surface;

at least one optical element disposed on said bottom surface of said first wafer;

at least one discrete opto-electronic transducer element disposed in communication with said bottom surface of said first wafer and in optical communication with said optical element; and

an optical waveguide;

wherein said first wafer and said optical element form an optical relay which relays light between said discrete opto-electronic transducer and said optical waveguide and thereby forms an efficient optical coupling between said discrete opto-electronic transducer and said optical waveguide.

26. An electro-opto-mechanical assembly comprising:

a first wafer, said wafer having a top and bottom surface;

at least first and second optical elements disposed on said top surface of said first wafer;

at least first and second discrete opto-electronic transducer elements disposed on said bottom surface of said first wafer and in optical communication with respective said first and second optical elements; and

at least first and second optical waveguides;

wherein said first wafer and said first optical element form an optical relay which relays light between said first discrete opto-electronic transducer and said first optical waveguide and thereby forms an efficient optical coupling between said first discrete opto-electronic transducer and said first optical waveguide; and

wherein said first wafer and said second optical element form an optical relay which relays light between said second discrete opto-electronic transducer and said second optical waveguide and thereby forms an efficient optical coupling between said second discrete opto-electronic transducer and said second optical waveguide.

27. The electro-opto-mechanical assembly recited in claim 26, further comprising a lens layer disposed on said top surface of said first wafer, said lens layer for forming said optical elements.

28. The electro-opto-mechanical assembly recited in claim 26, further comprising a circuit layer disposed on said bottom surface of said first wafer, said circuit layer for providing electrical communication to said discrete opto-electronic transducers.

29. The electro-opto-mechanical assembly recited in claim 28, wherein a portion of said circuit layer absorbs some of a light beam emitted from said first discrete opto-electronic transducer to function as a monitor for said first discrete opto-electronic transducer.

30. The electro-opto-mechanical assembly recited in claim 1, wherein said first wafer has first and second lateral dimensions, said discrete opto-electronic transducer has third and fourth lateral dimensions, and wherein said least either said third or fourth lateral dimension is smaller than said either of said first or second lateral dimension.

31. The electro-opto-mechanical assembly recited in claim 23, wherein said first wafer has first and second lateral dimensions, said discrete opto-electronic transducer has third and fourth lateral dimensions, and wherein said least either said third or fourth lateral dimension is smaller than said either of said first or second lateral dimension.

32. The electro-opto-mechanical assembly recited in claim 25, wherein said first wafer has first and second lateral dimensions, said discrete opto-electronic transducer has third and fourth lateral dimensions, and wherein said least either said third or fourth lateral dimension is smaller than said either of said first or second lateral dimension.

33. The electro-opto-mechanical assembly recited in claim 26, wherein said first wafer has first and second lateral dimensions, said first discrete opto-electronic transducer has third and fourth lateral dimensions, and wherein said least either said third or fourth lateral dimension is smaller than either of said first or second lateral dimension.

34. An electro-opto-mechanical assembly comprising:

a first wafer, said wafer having a top and bottom surface;

at least first and second optical elements disposed on said top surface of said first wafer;

at least first and second discrete opto-electronic transducer elements disposed on said bottom surface of said first wafer and in optical communication with respective said optical elements;

at least first and second optical waveguides; and

means for reducing crosstalk between at least two of said discrete opto-electronic transducer elements from said first wafer;

wherein said first wafer and said first optical element form an optical relay which relays light between said first discrete opto-electronic transducer and said first optical waveguide and thereby forms an efficient optical coupling between said first discrete opto-electronic transducer and said first optical waveguide; and

wherein said first wafer and said second optical element form an optical relay which relays light between said second discrete opto-electronic transducer and said

second optical waveguide and thereby forms an efficient optical coupling between said second discrete opto-electronic transducer and said second optical waveguide.